Using Informal Oral Presentations in Engineering Classes: Training Students for the "You Got a Minute" Moment

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Introduction

In today's workplace, employers expect their employees to communicate with supervisors, peers, and others in the organization through formal reports and presentations, as well as impromptu meetings and on the floor explanations. These impromptu meetings and on the floor explanations often begin with the common phrase "you got a minute." Research has shown that communication is an important skill for engineers and the lack of preparation has been illustrated in the literature.[1,2,3] Through conversations with employers, recent graduates, and returning co-op students, the author has learned that many graduating students are not ready for these "you got a minute" moments. Returning co-op students are sometimes surprised that they were asked to summarize a report as they submitted their work to their supervisor. This was a surprise to the author on his first co-op. Employers have expressed a concern over the lack of clarity, confidence, and sometimes professionalism shown by new hires. Through discussions with practicing engineers, it has become clear that for some engineers the informal oral presentation of information is a common occurrence in day to day activities. Some examples include (a) informing operators of new procedures after emergency modifications or changes to machines and operating procedures (b) giving supervisors a quick explanation of current project status and (c) being brought into a meeting to give the engineering perspective.

Preparing students for these "you got a minute" moments is often not addressed in the undergraduate curriculum. Either through tradition or to comply with ABET standards, industrial engineering programs include formal written reports and presentations as part of their curriculum. Although these formal presentations and written reports are commonly used by practicing industrial engineers, they do not prepare students for this other vital communication skill.

This paper will present examples of assignments that include these informal communication tasks, rubrics for evaluating students, and discussion of using these assignments in fulfilling the ABET standards. The rubrics are based on five key areas that have been identified as very important in verbal communication for the practicing engineer. These areas are, knowledge, confidence, professionalism, clarity, and responding to others verbal and nonverbal communication. These aspects were identified, by the author, through conversations with employers, practicing engineers, and recent graduates. Although the key areas are easily agreed upon, how best to satisfy them during a conversation is open to some interpretation by the individuals involved in the conversation. Therefore, the goal of the activities is to get students to think and reflect on how they communicate, how others communicate, successful communication, poor communication and goals of professional communication. Hopefully, through this thought and reflection, the students will become aware of their communication styles and can become better communicators.

The examples come from three separate senior-level industrial engineering courses taught at the University of Wisconsin-Platteville. These courses incorporate this less formal type of

communication into the curriculum. Examples include surprise drop in meetings, by the instructor, concerning student group progress on semester-long projects in a facilities design course, explaining to operators how to operate a slightly altered manufacturing line in a manufacturing systems design course, and presenting a quick demonstration of a new system to a supervisor in a material handling and warehousing course. Although the informal communication activities presented in the paper are geared towards specific industrial engineering situations, they share a lot in common with all quick informal conversations that are commonly known as an "Elevator Talk." Thus, preparing students for these technical informal communications will also prepare them for other aspects of their careers as professionals.

Manufacturing System Design Course

Manufacturing System Design is a senior level required technical elective for IE students with a production emphasis. This course is taken in either the fourth or fifth year (many students take five years to complete the program as many complete a co-op).   The course covers the design and control of different manufacturing systems with a focus on automated systems. Labs consist of programming the control of a variety of automated systems.

Category	0	1	2	3	Notes
Professionalism	Detrimental to the Training Session	Somewhat distracting or off topic	Mostly on topic	Attentive and on Topic	
Knowledge	Shows little or no knowledge of topic	Limited knowledge of topic	Knowledgeable	Shows complete knowledge	
Clarity	Cannot be understood	Discussion required to understand	Few questions required to understand	Easily understood	
Confidence	Shows no confidence in self	Shows little confidence or significant overconfidence	Mostly confident or overconfident	Confident in knowledge and communication	
Reaction to trainee's questions	Does not respond to questions	Seems annoyed and/or pays little attention to questions	Tries to answer questions	Encourages and answers questions completely and effectively	
Reaction to trainee's nonverbal communication	Does not pick up on nonverbal communication	Seems annoyed and/or pays little attention to nonverbal communication	Tries to respond to nonverbal communication	Uses nonverbal communication to improve training session	

Figure 1: Rubric for grading MSD training sessions

In this course, the "you got a minute" activity is part of multiple lab assignments. Labs are completed individually or in teams of two students. All labs are partially graded based on the students demonstrating their working system to the instructor. In particular, two labs require that the students program an industrial robot and an operator interface panel that is used to control the robot. After completing and testing the program, the students are given limited time to instruct the operator on the new operating procedure. Although formal training sessions, with well

written guidelines and manuals, are the preferred method of training, the quicker on-the-go training sessions that these labs simulate is often what time will allow. When possible, an individual with basic knowledge of interface devices is used as a stand in for the operator. These operators are IE students not in the course (students often enter the lab to see what we are doing), touring high school students, attendees at the annual EMS EXPO, or other random individuals. The instructor serves as the operator when necessary.

Students are given clear guidelines on both the functions that the robot must complete and the operator training requirements. Grading of the lab assignments is based on the program's ability to complete the given tasks and the student's ability to train the operator. The training grade is based on the student's professionalism, knowledge, clarity, confidence, reaction to trainee's questions, and reaction to trainee's nonverbal communication. This grading is done through the use of the rubric in figure 1, however, the rubric is not shared directly with the student. While training an individual, the interactions, both verbal and nonverbal, between the trainer and trainee are very important. This important interaction is captured in the last two categories on the rubric. To help students improve their communication, they receive feedback from both the instructor and the trainee after the training session is complete. When it is deemed appropriate, the instructor has a private discussion with the trainee to gain additional feedback that can be shared with the student in a filtered form.

Student performance in the training portion of the lab improves from the first to second lab. This was observed through both scores on the rubrics and feedback from the trainees. Students have also commented that they are more confident and prepared to give short explanations and demonstrations on the spur of the moment after completing these labs. To fulfill ABET standards on communication, these assignments and completed rubrics will be used to show that students have successfully achieved a competency in verbal communication.

Facilities Design Course

Facilities Design is a senior level course required for all IE students. This course is usually taken by students during the last two semesters before graduation. Many students enrolled in the course have actual IE work experience through either a co-op (2 consecutive semesters) or internship (1 semester).

In this course, the "you got a minute" activity is part of a semester long, industry sponsored project. These projects consist of the students forming teams (4-5 students each) that act as consultants on a project for a local business. Part of the grade for the project is based on status report meetings that the students have with the instructor. These meetings may be scheduled or "surprise," at the instructors discretion. Meetings are kept as short as possible, 15-20 minutes, and are just long enough for each member to have a chance to participate. There are three goals to the meetings. The primary goal is to motivate the students to work on the project throughout the semester, in an attempt to ensure a high quality product for the client. The second goal is to give the students a chance to ask questions about the project and related material from the course. The third goal is the evaluation of the student's informal communication skills in a rapid and fluid environment.

Students are informed of the goals of the meetings and that they will be graded on how well they articulate their ideas and knowledge during the meetings. Since the students are unaware of when the meetings will occur and what questions will be asked during the meetings, it is impossible for them to create prepared statements. Each student receives a score of 0-3 in each of 5 areas, for a maximum score of 15 points per meeting. The scoring is completed through the use of a rubric, shown in figure 2. The rubric is not shared with the students to prevent students from checking off items during the meeting. However, after each meeting, the instructor shares comments with students about their performance and encourages them to reflect on the experience. After the last status report, students receive a summary of their rubrics and instructor comments.

Category	0	1	2	3	Notes
Participation	No Participation	Participates minimally only when prompted	Participates with some prompting	Willingly participates with no prompting	
Professionalism	Detrimental to the Meeting	Somewhat distracting or off topic	Mostly on topic	Attentive and on Topic	
Knowledge	Shows little or no knowledge of topic	Limited knowledge of topic	Knowledgeable	Shows complete knowledge	
Clarity	No basis for discussion	Discussion required to understand	Few questions required to understand	Easily understood	
Confidence	Shows no confidence in self	Shows little confidence or significant overconfidence	Mostly confident or overconfident	Confident in knowledge and communication	

Figure 2: Rubric for grading Facilities Design status meetings

Student performance in the status meetings improves throughout the semester. This was observed both in scores on the rubrics and from improved efficiency in the meetings. In addition, clients (local business) have commented that the students' communication skills improved during the four to five meetings held with the client during the course of the semester. In informal feedback sessions with the students, it has come to light that the overall communication among teams and team members improved during the course of the project. Although this cannot be directly related to the use of the status report meetings, the students thought that the meetings and discussion of communication skills were beneficial. To fulfill ABET standards on communication, these assignments and completed rubrics will be used to show that students have successfully achieved a competency in verbal communication.

Material Handling and Warehousing Course

Material Handling and Warehousing is a senior level technical elective for IE students with either a production or management emphasis. This course is taken in either the fourth or fifth year (many students take five years to complete the program because of co-op). The course covers the principles of material handling, material handling equipment, system design, warehouse design, and warehouse operations.

In this course, the "you got a minute" activities are part of multiple lab assignments. These lab assignments are either system design or equipment selection based labs. In these labs, students are asked to prepare a short report to specify their design/selection and to give a justification. For some of the design labs, students are asked to perform a small demonstration for the instructor. Although these demonstrations are not part of the graded assignment, they give the students an opportunity to practice their informal communication skills. During the demonstration, the instructor focuses on the design, while making mental notes about the student's communication skills. After the demonstration, the instructor gives feedback on the student's communication skills. These follow up feedback sessions are not part of the grade, rather they attempt to have the student perform a reflection and determine his/her own weaknesses. Since these demonstrations are not part of the graded assignment, no rubric is used; however, the focus of the feedback sessions is on the student's professionalism, knowledge, clarity, and confidence.

Assignments that do not contain a demonstration for the instructor require only a written report. When the students turn in these written reports, they are asked to verbally give a short summary of the report. If this is done outside of regular class time, the short summary is given to the instructor, who is acting as a supervisor. If reports are turned in during regular class time, the short summary is given to the entire class. After groups with the same assignment give their justifications, then a short discussion is held on how the presentation may affect the selection of competing solutions.

Although no quantitative data is collected on the performance of students' informal communication skills, there is anecdotal evidence to support the improvement. Observations by both the instructor and the students show progress in the areas of professionalism, knowledge, clarity, and confidence during informal presentations.

Skill Development

It is poor practice to grade students on criteria that they are not reasonably made aware of. Some instructors provide grading rubrics to students when the assignment is assigned to help clarify expectations. Providing rubrics can be an extremely productive educational practice when the assignment is designed to teach a specific skill in applying a given technique. It is the standard policy of the author not to provide rubrics to students for multiple reasons. First, not providing the rubrics forces the students to focus on determining the appropriate response to the situation and skill selection, rather than focusing on "checking off" the items on the rubric. Second, rarely do supervisors or clients provide such a detailed road map to solving engineering problems as a rubric. Last, in these informal communication skills assignments, the rubrics might limit the quality of the reflective feedback sessions that occur between the student and faculty after the activity.

Similarly, it is poor educational practice to expect knowledge and abilities of our students for which we do not prepare them. In this situation, prior to taking the Manufacturing System Design or Facilities Design course, students have completed a general education speech course, as well as several industrial engineering courses which require formal presentations. Therefore,

it is reasonable to assume that students have a foundational knowledge in communication skills. The obvious exception to this reasoning is a student's reaction to the "trainees" questions in the Manufacturing System Design course. The ability to read and respond to an audience member is often not stressed during a discussion of formal presentation skills.

Although students are not fully trained in the communication skills required for these informal interactions when they are initially assessed, the skills are developed throughout the semester by way of reflection. These reflections are encouraged during feedback sessions between the instructor and student. Feedback is provided to the student in all categories, regardless of how the student performed in the category. After receiving feedback, students are asked to discuss their strengths and weaknesses and to discuss experiences with effective and ineffective communicators. These feedback sessions can be uncomfortable for students since they are discussing their weakness openly without having had significant time to reflect on the feedback. Despite this uncomfortable situation, the vast majority of students have had a positive experience. The choice to use a feedback session and not provide the rubric is strategic. The feedback sessions are another form of the impromptu meeting that the assignments are designed to simulate.

Conclusion

The use of these informal oral presentations has been very successful in assessing and improving student's communications skills. Overall, students have had positive experiences and indicate that the activities are worthwhile. Through personal experience and conversations with students, recent graduates, practicing engineers and employers, it has come to light that these informal oral communication skills are an important part of day to day life for an engineer. Given the importance of these skills, exposing engineering students to situations that require informal oral presentations and giving them a chance to reflect on their own communication skills should be part of the undergraduate curriculum.

This paper presented examples of different activities and rubrics used in the practice, assessment and reflection of informal communication skills. These assignments and completed rubrics can be used to show that students have successfully achieved a competency in verbal communication skills to satisfy ABET standards on verbal communication. Although these tools are useful, there is room for improvement and further study. Future work needs to be done on improving the activities and rubrics, as well as developing new activities and rubrics for other industrial engineering courses. Additionally, a more formal survey of employers and practicing engineers could be undertaken to gain both a broader and deeper understanding of the informal communication that occurs in day to day engineering practice. Finally, a follow up study assessing the effectiveness of these activities in improving informal communication skills would be prudent.

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